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ELECTRIC SUPERVISORY APPARATUS

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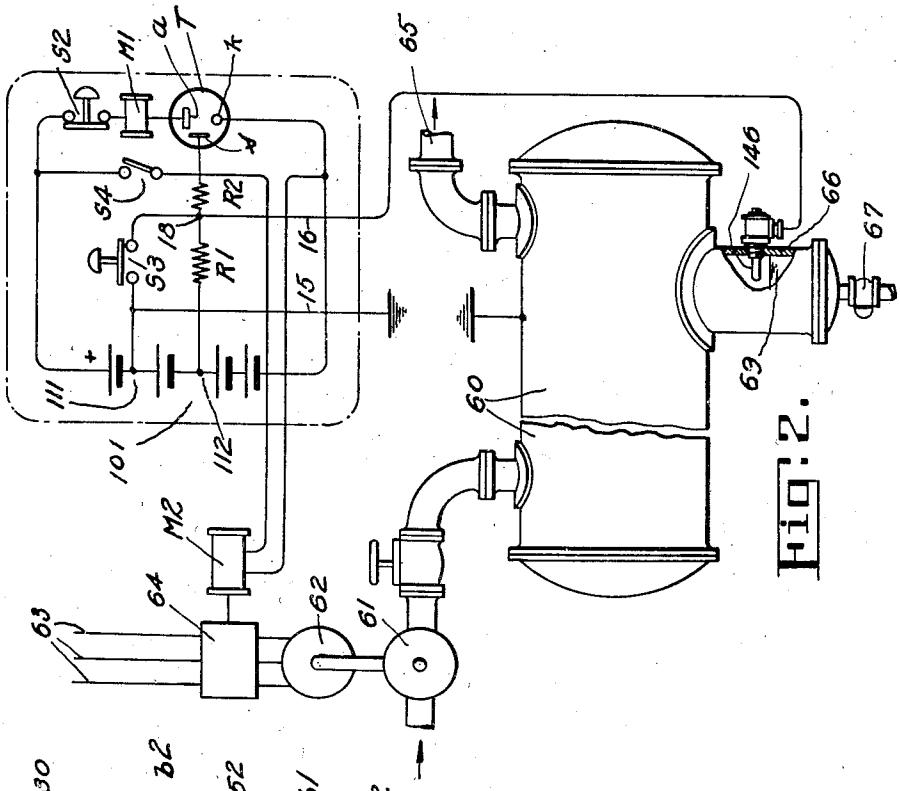


Fig. 2.

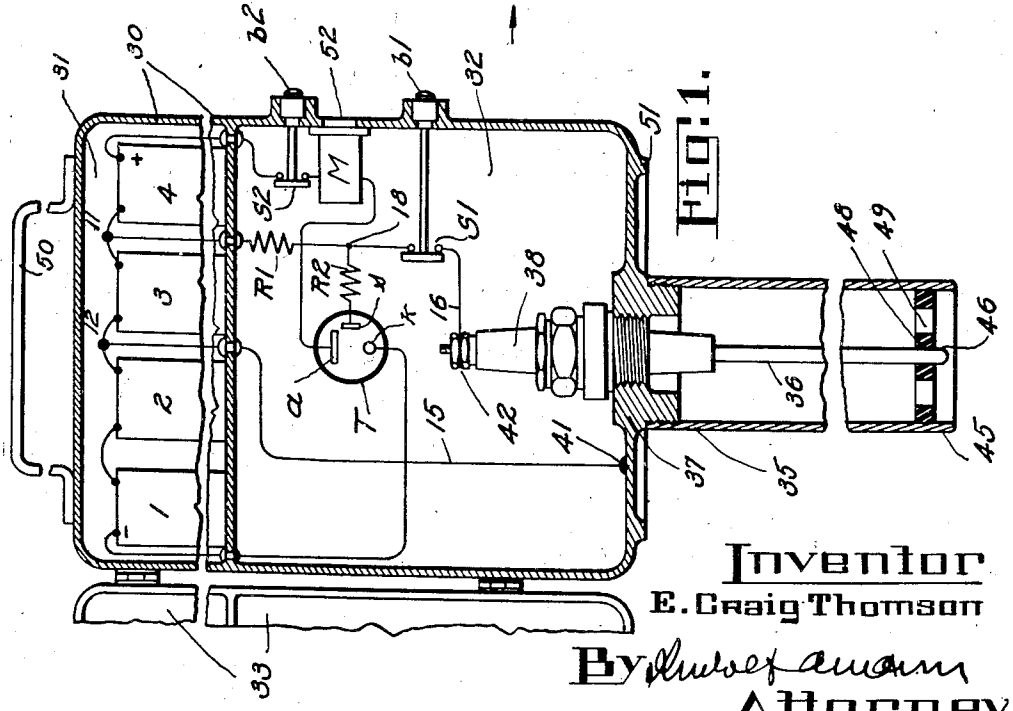


Fig. 1.

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ELECTRIC SUPERVISORY APPARATUS

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2 Claims. (Cl. 137—111)

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The present invention relates to electric supervisory apparatus particularly of the type using electron discharge tubes as links between impedances designed to supervise given operating conditions and devices which are to respond to changes of these conditions.

It is often desired to supervise operating conditions, such as for example the disposition of material in a storage vessel either above or below a given point, by means of a self-contained and reliable device which can be easily applied to the installation to be supervised, as for example by insertion without special adaptation or change of design, into remotely located tanks or storage vessels.

Some of the principal objects of the invention are to provide a device serving such requirements which, if necessary, is independent of external power supply but can be battery operated; which can be applied to the device to be supervised without adaptation or special construction; which consumes very little, and under certain conditions no current at all excepting when signaling a change of the supervised condition such as a liquid level; which can be very easily adapted for either high or low level detection; and which is very simple and therefore rugged and safe, and yet exact and reliable in operation.

These and other objects and aspects will be more fully apparent from the following description of a practical embodiment illustrating the genus of the invention. The description refers to a drawing in which

Fig. 1 is a section through a portable level detecting device, including a circuit incorporating the present invention, and

Fig. 2 a diagram of a circuit according to the invention as applied to a more permanent installation.

Fig. 1 shows a battery, consisting of several cells indicated at 1, 2, 3, 4, connected to the plate circuit of an electron discharge tube T for example of the cold cathode gas-filled type, with anode *a*, cathode *k*, and starting anode *s*. The battery has two taps 11, 12 to which is connected a detecting circuit which includes two detecting electrode lead wires 15, 16, a resistance R1 next to the tap 11 of higher voltage and, if desired, a normally closed testing switch S1 in series with R1. A point 18 intermediate wire 16 and resistance R1 is connected, through a resistance R2, to control electrode *s*.

The output circuit of tube T may include a normally closed resetting switch S2 and a signaling lamp, indicating instrument or relay magnet

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schematically shown at M, for signaling a change of the supervised condition, or for operating apparatus appropriately responding to this change.

As indicated in Fig. 1, the entire electrical apparatus may be enclosed in a housing 30 which has a compartment 31 for the battery, a compartment 32 for the circuit proper, and a door 33 which may seal battery and circuit from each other and from the outside.

One probe electrode may consist of a tube 35 fixed to a boss 37 of housing 30, which boss has an opening through which leads a rod 36 constituting the other electrode, supported by an insulating bushing 38. Lead wire 15 may be soldered at 41 to housing 30 which is in conductive connection with tube 35 and may provide a ground connection. To provide this ground connection, the housing 30 is accordingly preferably made of a conductive material such as a metal. Lead 16 is at 42 screwed to the inner end of probe rod 36.

Probe rod 36 and tube 35 may be secured by insulating separators 48, perforated at 49; the tip 46 of rod 36 may, for better protection, end inside the end 45 of tube 35.

A handle 50 may be provided for facilitating the insertion of tube 35 for example into the filling hole of a tank, upon which the bottom of housing 30 may rest with rim 51, effectively closing the tank opening.

The indicating lamp or instrument M may be visible through a window 52 of housing 30, and switches S1, S2 may be operated by means of push buttons *b1*, *b2* brought out through suitable bushings.

It will be understood that the detecting electrodes may be arranged in any suitable manner and that for example, the tank itself may constitute one electrode, in which case tube 35 may be omitted, provided that conductive contact between housing 30 and the tank upon which it is placed can be securely established.

This arrangement operates as follows, assuming that probes 45, 46 reach down to that point inside of a filled tank below which the level of material therein is not supposed to fall.

The current flowing in circuit 11–R1–S1–16–46–45–41–15–12 which circuit includes the material as a detecting impedance, causes a potential drop in resistor R1 so that starter *s* is at a lower potential than tap 11, which potential is insufficient to initiate discharge of tube T.

If the liquid level falls below point 46, the above-traced circuit is broken, and starter *s* assumes the potential of tap 11 which is high

enough to render tube T conductive. The plate current of T operates device M until the plate circuit is interrupted at S2. If a suitable tube of the visibly glowing cathode type is used, the device M may be dispensed with; in that case, tube T takes the place of M at window 52.

An embodiment of the present invention adapted for normally infinite detecting impedance is shown in Fig. 2.

This figure shows the application of a circuit according to the invention to apparatus for separating water from gasoline. A tank 60 contains a device for separating water from gasoline fed into the tank by a pump 61 driven by electromotor 62 which is connected to current supply line 63 through starter switch 64. The purified gasoline leaves through duct 65, whereas the water accumulates in a sump 66 from where it is removed by an automatic dump valve 67. It may happen that more water accumulates than can be discharged, and in that case the gasoline supply has to be interrupted; the arrangement according to Fig. 2 takes care of this contingency as follows.

A potential apportioning device 101, which may be a battery as shown in Fig. 1, is again connected to the output circuit, containing magnet M1 and operating switch S2, of a tube T and has taps 111, 112 of higher and lower intermediate potential. Probe electrode 146 is mounted above the maximum level to which the water 69 in sump 66 is permitted to rise. It will be noted that resistance R1 is in this instance connected to low potential tap 112. A normally open testing switch S3 is connected in parallel to probe wires 15, 16.

The probe circuit 111–15–ground–60–69–146–16–18–R1–112 is in this case normally open, starter anode *s* has a potential too low to ignite the tube, and magnet M1 is deenergized. If the water level reaches probe 146, current flows in the above circuit, causing a voltage drop in resistance R1. The potential of starting anode *s* is raised, the tube becomes conductive and magnet M1 is energized. The circuit of switch S4 is closed by M1, which energizes magnet M2 that in turn opens motor switch 64 stopping pump 61 and the flow of gasoline into tank 60.

If it is desired to resume operation of the apparatus, after normal condition is restored, opening of switch S2 will deenergize magnet M1 and cause starting of pump 61.

Switches S1 (Fig. 1) and S3 (Fig. 2) may be provided for testing the respective circuits. It will now be evident that switch S1 duplicates the function of receding material which opens connection between probes 45 and 46 (Fig. 1) and that switch S3 closes the detecting circuit similar to water rising to the level of probe 146.

It will be apparent that a circuit according to Fig. 2 could be used in a housing with probes similar to those shown in Fig. 1, but with the probes short enough to provide high level detection. Similarly, the circuit according to Fig. 1 can be used to operate a relay arrangement as suggested in Fig. 2, responsive to low level detection.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

I claim:

1. Battery operated electric supervisory apparatus for separating water from gasoline or the like comprising, in combination with a main container having an inlet to said container for mixed water and gasoline or the like, a water settling container connected with said main container, and a water outlet from said settling container; a cold cathode type electron discharge tube having an anode, a cathode, and a starting electrode; a battery having two end terminals and two auxiliary terminals intermediate said end terminals; a relay for closing said inlet when energized; the anode-cathode circuit of said discharge device being connected to said end terminals and including said relay; said auxiliary terminals having between them a relatively low potential, one of said auxiliary terminals being at a potential above and the other of said auxiliary terminals at a potential below the starting potential of said discharge device; a resistor connected at one end to the auxiliary terminal at less than starting potential and at the other end to said starting electrode; a probe electrode disposed in said water settling container above the height to which water may be permitted to rise in a separating operation, and connected to said starting electrode; and a connection from said auxiliary terminal at higher than starting potential to said water settling container and through said container to the water therein contained; whereby when said water touches said probe electrode, said terminal at higher than starting potential is connected to said starting electrode and said discharge tube is rendered conductive to energize said relay; said relatively low potential preventing sparking at said probe electrode when said water falls away therefrom.

2. A supervisory installation in accordance with claim 1 having a normally open testing switch connected from said auxiliary terminal at higher than starting potential to said starting electrode, and a normally closed resetting switch in said anode-cathode circuit.

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